

EH Resident Competency 1.22

Competency 1.22 EH Residents shall demonstrate a familiarity level knowledge of the safety hazards associated with machinery and machine guarding.

1. Supporting Knowledge and Skills

- a. Given a specific type of machine, identify the potential hazards and appropriate guards associated with the following:
 - Pinch points
 - Point of operation
 - Reciprocating components
 - Rotating components
- b. Describe the purpose and typical use of each of the following types of barriers:
 - Physical
 - Location (distance)
 - Electronic
 - Magnetic
 - Procedural/administrative controls
 - Special tools

2. Self-Study Activities (corresponding to the intent of the above competency)

Below are two web sites containing many of the references you may need.

Web Sites		
Organization	Site Location	Notes
Department of Energy	http://wastenot.inel.gov/cted/stdguido.html	DOE Standards, Guides, and Orders
OSHA	http://www.osha-slc.gov/	OSHA documents and search engine
U.S. House of Representatives	http://law.house.gov/cfr.htm	Searchable Code of Federal Regulations

Read the summary section below.

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Review Title 29 CFR 1910, Subpart O.

EXERCISE 1.22-A Select a specific type of mechanical equipment and complete a table similar to the one below for it.

Type	Potential Hazards	Guards
Pinch Points		
Point of Operation		
Reciprocating Components		
Rotating Components		

EXERCISE 1.22-B State the purpose and typical use for each of the following types of barriers:

- Physical
- Location (distance)
- Electronic
- Magnetic
- Procedural/administrative controls
- Special tools

3. Summary

Competency 1.22 deals with occupational safety hazards associated with machinery and machine guarding. The primary reference for this competency is Title 29 CFR 1910, Subpart O. This regulation covers a broad spectrum of mechanical equipment as well as a variety of safety measures used for each. It is, therefore, not possible to cover all pieces or even types of equipment or their safety features in this self-study guide. The purpose of this guide, therefore, is to relate some general pieces of information regarding these topics.

Hazards

29 CFR 1910, Subpart O, covers various types of hazards. This guide covers the following:

- Pinch points
- Point of operation
- Reciprocating components
- Rotating components

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Pinch Points

The primary potential hazard related to pinch points is damage to hands and fingers from pinching or falling parts. Several types of guards can be used to minimize that hazard. The following list identifies some of those.

- Friction brakes
- Mechanical guards to prevent access
- Gates or movable barriers
- Workpiece rests and clamps
- Machine location
- Point of operation

The primary potential hazards related to the point of operation are damage to hands and fingers from pinching or falling parts, damage to eyes and other bodily injury from leaking lubrication or flying parts, and bodily injury from clothing catching on moving parts. Several types of guards can be used to minimize those hazards. The following list identifies some of those.

- Friction brakes
- Protected foot pedals
- Hand-operated levers with spring latches
- Two-hand trips
- Lockable power disconnects
- Protected motor start buttons
- Gates or movable barriers
- Presence sensing devices
- Blade guards
- Workpiece rests and clamps
- Machine location
- Shut-off valves

Reciprocating Components

The primary potential hazards related to the point of operation are damage to hands and fingers from pinching or falling parts and damage to eyes and other bodily injury from leaking lubrication or flying parts. Several types of guards can be used to minimize those hazards. The following list identifies some of those.

- Friction brakes
- Protected foot pedals
- Hand-operated levers with spring latches
- Lockable power disconnects
- Protected motor start buttons
- Gates or movable barriers

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- Blade guards
- Work piece rests and clamps
- Machine location
- Components

The primary potential hazards related to the point of operation are bodily injury from clothing catching on rotating parts and damage to eyes and other bodily injury from flying parts. Several types of guards can be used to minimize those hazards. The following list identifies some of those.

- Protected foot pedals
- Lockable power disconnects
- Protected motor start buttons
- Gates or movable barriers
- Blade guards
- Work piece rests and clamps
- Machine location
- Shut-off valves

Barriers

Barriers minimize the risk of occupational injury. The following are covered by this self-study guide:

- Physical
- Location (distance)
- Electronic
- Magnetic
- Procedural/administrative controls
- Special tools

Physical

The purpose of physical barriers is to reduce the probability of injury by limiting access to dangerous areas or components. One typical use of this type of barrier is a mechanical guard that prevents contact with pinch points or moving parts.

Location (distance)

Location barriers reduce the probability of injury by ensuring that sufficient distance exists between the equipment and other material, equipment, structures, or personnel. Typically, the location of guards is such that additional pinch points are not created and that maximum protection is provided for the worker. Equipment is located so that the surrounding environment does not produce an additional safety hazard by the location of that equipment. When possible, machinery is located away from the normal work areas.

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Electronic

The purpose of electronic barriers is to reduce the probability of injury by controlling the operation of the equipment or by causing shutdowns under certain conditions. Electronics are also an integral part of several types of guards. Typical uses include electronic speed controllers, presence detectors, proximity detectors, overspeed devices, and overcurrent devices.

Magnetic

Magnetic barriers reduce the probability of injury by preventing material from slipping while being worked. Additional uses of magnetic barriers include electronic speed controllers, presence detectors, and proximity detectors.

Procedural/administrative controls

Procedural and administrative controls help to reduce the probability of injury by establishing operation- and maintenance-related safety rules. Although the establishment of rules does not directly improve safety, the adherence to those rules certainly can. Typically, safety procedures include operational and maintenance guidance for detailed work, specific safety steps, and general safety policy.

Special tools

The purpose of special tools is to reduce the probability of injury by providing safer, alternative means for the machine operator to perform activities. Special tools are normally used to handle safety needs that are specific to individual equipment or types of equipment. For more information, refer to the *Machinery and Machine Guarding Surveillance Guide*, developed by the Department of Energy's Oak Ridge Operations Office.

4. Exercise Solutions

EXERCISE 1.22-A Select a specific type of mechanical equipment and complete a table similar to the one below for it.

ANSWER 1.22-A The answer to this exercise is time-dependent, site-specific, and will vary widely with the selection of equipment. There are a large number of possible correct answers to this exercise. There is, however, information that applies to most equipment of a specific hazard type. The table below shows some, but not all, of those possible answers.

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Occupational Hazards from Machinery and Their Mitigation		
Type	Potential Hazards	Guards
Pinch Points	<ul style="list-style-type: none"> Damage to hands and fingers from pinching or falling parts. 	Friction brakes Mechanical guards to prevent access Gates or movable barriers Workpiece rests and clamps Machine location
Point of Operation	<ul style="list-style-type: none"> Damage to hands and fingers from pinching or falling parts. Damage to eyes and other bodily injury from leaking lubrication or flying parts. Bodily injury from clothing catching on moving parts. 	Friction brakes Protected foot pedals Hand-operated levers with spring latches Two-hand trips Lockable power disconnects Protected motor start buttons Gates or movable barriers Presence-sensing devices Blade guards Workpiece rests and clamps Machine location Shut-off valves
Reciprocating Components	<ul style="list-style-type: none"> Damage to hands and fingers from pinching or falling parts. Damage to eyes and other bodily injury from leaking lubrication or flying parts. 	Friction brakes Protected foot pedals Hand-operated levers with spring latches Lockable power disconnects Protected motor start buttons Gates or movable barriers Blade guards Workpiece rests and clamps Machine location
Rotating Components	<ul style="list-style-type: none"> Bodily injury from clothing catching on rotating parts. Damage to eyes and other bodily injury from flying parts. 	Protected foot pedals Lockable power disconnects Protected motor start buttons or movable barriers Blade guards Workpiece rests and clamps Machine location Shut-off valves

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EXERCISE 1.22-B State the purpose and typical use for each of the following types of barriers:

- Physical
- Location (distance)
- Electronic
- Magnetic
- Procedural/administrative controls
- Special tools

ANSWER 1.22-B There are many possible answers for this question. The following list identifies some, but not all, of those possible answers.

Physical

Purpose -- Reduce the probability of injury by limiting access to dangerous areas or components.

Typical Use -- Mechanical guards that prevent contact with pinch points or moving parts.

Location (distance)

Purpose -- Reduce the probability of injury by ensuring that sufficient distance exists between the equipment and other material, equipment, structures, or personnel.

Typical Use -- Location of guards is such that additional pinch points are not created and to provide the maximum protection for the worker. Equipment is located so that the surrounding environment does not produce an additional safety hazard by the location of that equipment. When possible, machinery is located away from the normal work areas.

Electronic

Purpose -- Reduce the probability of injury by controlling the operation of the equipment or by causing shutdowns under certain conditions. Electronics are also an integral part of several types of guards.

Typical Use -- Electronic speed controllers, presence detectors, proximity detectors, overspeed devices, and overcurrent devices.

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Magnetic

Purpose -- Reduce the probability of injury by preventing material from slipping while being worked. In some cases, magnetics are also used in the determination of presence or proximity.

Typical Use -- Electronic speed controllers, presence detectors, and proximity detectors.

Procedural/administrative controls

Purpose -- Reduce the probability of injury by establishing operation- and maintenance-related safety rules.

Typical Use -- Operational and maintenance guidance for detailed work, specific safety steps, and general safety policy.

Special tools

Purpose -- Reduce the probability of injury by providing safer, custom-designed means for the machine operator to perform activities.

Typical Use -- Handle safety needs that are specific to individual equipment or types of equipment.